

Python code followed by a picture of my by-hand attempt.

```
import numpy
from numpy import *
from numpy.linalg import *

# With numpy matrices, you can add, subtract, multiply, find the transpose
# find the inverse, solve systems of linear equations and much more.

# Solve a system of consistent linear equations. Refer to Lial Section 2.5
# Example 7 Cryptography for the calculation

# Right hand side of system of equations has data entered as a list
# and converted to 3x1 matrix and then a 1x3 matrix using the transpose
# function. Similar steps are taken for the matrix A.

rhs= [10, 6, 5, 7]
rhs=matrix(rhs)
rhs=transpose(rhs)
print ("\nRight Hand Side of Equation")
print rhs

A =[[2,90,2,0], [1,80,2,3],[1,20,3,7],[2,30,0,7]]
A= matrix(A)
print ("\nMatrix A")
print A

# Numpy has various functions to perform matrix calculations. The inverse
# function inv() is one of those.

# Find inverse of A.
print ("\nInverse of A")
IA= inv(A)
print IA

# In what follows, I am converting matrices with floating point numbers to
# matrices with integer numbers. This is optional and being done to show
# that it is possible to do so with numpy matrices.

# Note that the function dot() performs matrix multiplication.
# Verify inverse by multiplying matrix A and its inverse IA.

print ("\nIdentity Matrix")
I= dot(IA,A)
I= (I) # This converts floating point to integer.
print I

# Solve the system of equations and convert to integer values.
# With numpy it is necessary to use dot() for the product.
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result = dot(lA,rhs)
#result = int_(result) # This converts floating point to integer.
#result = rint(result).astype(int)
print ("\nSolution to Problem")
print result

# There is a more efficient way to do this with the linalg.solve() function.

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print ("\nIllustration of solution with linalg.solve(,) function")
result2= linalg.solve(float_(A),float_(rhs))
print result2 # This converts floating point to integer.

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eq1=result[0,0]*2+result[1,0]*90+2*result[2,0]
eq2=result[0,0]+result[1,0]*80+2*result[2,0]+3*result[3,0]
eq3=result[0,0]+result[1,0]*20+3*result[2,0]+7*result[3,0]
eq4=result[0,0]*2+result[1,0]*30+7*result[3,0]
print '\n'
print ("\n equation 1 output: %d" ) %eq1
print ("\n equation 2 output: %d" ) %eq2
print ("\n equation 3 output: %d" ) %eq3
print ("\n equation 4 output: %d" ) %eq4

```

Left Page:

	cup of coffee	high 1 comp	g of alcohol	g of stress	breaky of bread
2	90	2	0	10	
1	80	2	3	5	
1	20	3	7	5	
2	30	0	7	7	

$R_1: 2a + 90b + 2c = 10$
 $R_2: a + 80b + 2c + 3d = 5$
 $R_3: a + 20b + 3c + 7d = 5$
 $R_4: 2a + 30b + 7d = 7$

$60b - c - 4d = 1$
 $60b + 2c - 7d = 3$
 $-3c + 3d = -2, c = \frac{2}{3} - d$
 $c - d = \frac{2}{3}$

$R_2: a + 80b + 2(\frac{2}{3} - d) + 3d = 5$
 $a + 80b + \frac{4}{3} - 2d + 3d = 5$
 $a + 80b + d = \frac{11}{3}$
 $a + 20b + 3(\frac{2}{3} - d) + 7d = 5$
 $a + 20b + 2 - 3d + 7d = 5$
 $a + 20b + 4d = 3$
 $2a + 30b + 7d = 7$

$a + 80b + d = \frac{11}{3}$
 $a + 20b + 4d = 3$
 $-10b - d = 1$
 $-9d = \frac{23}{3}, d = -\frac{23}{27}$

Not right but can't see where my math is wrong

Right Page:

	cup of coffee	high 1 comp	g of alcohol	g of stress	breaky of bread
2	90	2	0	10	
1	80	2	3	5	
1	20	3	7	5	
2	30	0	7	7	

$R_1 - R_2$
 $R_3 - R_2$
 $R_4 - R_1$

$1 \ 45 \ 1 \ 0 \ 5$
 $0 \ 1 \ -\frac{1}{60} \ -\frac{1}{60} \ \frac{1}{60}$
 $0 \ -25 \ 2 \ 7 \ 0$
 $0 \ -60 \ -2 \ 7 \ 3$

$1 \ 0 \ 0 \ 7 \ \frac{26}{7}$
 $0 \ 1 \ 0 \ \frac{145}{70} \ \frac{1}{60}$
 $0 \ 0 \ 1 \ \frac{245}{170} \ 0$
 $0 \ 0 \ -3 \ 3 \ 4$

$1 \ 0 \ 0 \ 7 \ \frac{26}{7}$
 $0 \ 1 \ 0 \ \frac{145}{70} \ \frac{1}{60}$
 $0 \ 0 \ 1 \ \frac{245}{170} \ 0$
 $0 \ 0 \ -3 \ 3 \ 4$

$1 \ 0 \ 0 \ 7 \ \frac{26}{7}$
 $0 \ 1 \ 0 \ \frac{145}{70} \ \frac{1}{60}$
 $0 \ 0 \ 1 \ \frac{245}{170} \ 0$
 $0 \ 0 \ -3 \ 3 \ 4$

$1 \ 0 \ 0 \ 7 \ \frac{26}{7}$
 $0 \ 1 \ 0 \ \frac{145}{70} \ \frac{1}{60}$
 $0 \ 0 \ 1 \ \frac{245}{170} \ 0$
 $0 \ 0 \ -3 \ 3 \ 4$